



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
11.12.2013 Bulletin 2013/50

(51) Int Cl.:
G08B 7/06 (2006.01) **G08B 25/12** (2006.01)
G08B 27/00 (2006.01)

(21) Application number: **13170362.1**

(22) Date of filing: **04.06.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **Bersano, Marco**
14041 Agliano Terme (AT) (IT)

(72) Inventor: **Bersano, Marco**
14041 Agliano Terme (AT) (IT)

(74) Representative: **Vitillo, Giuseppe**
Barzanò & Zanardo Milano S.p.A.
Corso Vittorio Emanuele II, 61
10128 Torino (IT)

(30) Priority: **07.06.2012 IT TO20120498**

(54) **An alarm system for an area to be monitored, in particular a commercial or industrial area, such as a construction site**

(57) The alarm system (10) comprises a master device (12) and a plurality of slave devices (14), which are controlled by said master device (12). Each slave device can be installed in a region and comprises: a signalling apparatus (16) to provide an alarm indication detectable by the people standing in said area, and a control organ (18) that can be activated by an operator in case of danger. Each slave device activates its own signalling apparatus and transmits an emergency signal to the master device, when its own control organ is activated. The master device transmits an activation signal to the slave devices as a function of the emergency signal. The slave devices activate their own signalling device when they receive the activation signal. The devices transmit and receive the signals through a wireless telecommunication network.

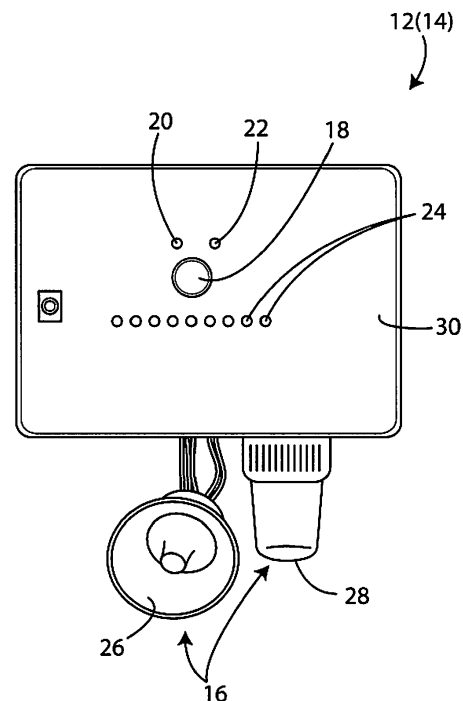


Fig. 3

Description

Technical field

[0001] The present invention is relative to an alarm system for an area to be monitored, in particular a commercial or industrial area, such as a construction site.

Technological background

[0002] In the technical field the use of alarm systems is known, which are suited to warn the people standing in an area to be monitored, in case in a monitored region of said area there occurs a dangerous event or an event that can potentially jeopardize the safety of the monitored region or of the whole area.

[0003] These alarm systems are generally used in commercial or industrial areas. In particular, they are used in construction sites having a wide working area, where operators often have to quickly and effectively transmit information concerning events that can put at risk the safety of other operators, even if they are standing in monitored areas that are different from the area in which the harmful event took place.

[0004] For example, in case a fire starts in one of the monitored areas, it is definitely useful for the operators to be able to warn the other operators standing in other monitored areas of the construction site, so as to organize the evacuation of the personnel in an orderly manner and to prepare the necessary intervention means.

Summary of the invention

[0005] The object of the present invention is to provide an improved alarm system, which, in particular, can be produced in a simple and economic fashion.

[0006] According to the present invention, this and other objects are reached by means of an alarm system according to appended claim 1.

[0007] Further optional features of the alarm system are defined in the appended dependent claims.

[0008] The appended claims are an integral part of the technical teachings provided in the following detailed description concerning the present invention.

Brief description of the drawings

[0009] Further features and advantages of the present invention will be best understood upon perusal of the following detailed description, which is provided by way of example and is not limiting, with reference to the accompanying drawings, which specifically show what follows:

- figure 1 is a schematic flowchart of an explanatory embodiment of an alarm system according to the present invention;
- figure 2 is a schematic flowchart of a further explan-

atory embodiment of an alarm system according to the present invention; and

- figure 3 is a schematic view of a device of an alarm system shown in the previous figures.

Detailed description of the invention

[0010] With reference to figures 1 and 2, number 10 indicates, in both figures, two explanatory embodiments of an alarm system according to the present invention.

[0011] Alarm system 10 is suited to control an area to be monitored, in particular a commercial or industrial area, such as a construction site. Though, as a person skilled in the art can clearly understand, system 10 can also be effectively used in working places other than construction sites.

[0012] System 10 comprises a master device 12 and a plurality of slave devices 14, which are controlled by said master device 12. In other words, the architecture of system 10 is of the so-called "master/slave" type, in which slave devices 14 are configured to work in an autonomous manner, but master device 12, in predetermined operating conditions, is configured to take on a control role with respect to the plurality of slave devices 14.

[0013] In the embodiment shown in figure 3 one can see how master device 12 can have the same structure and, if necessary, the same look as slave devices 14 and, if necessary, can be selected among one of slave devices 14 themselves, but, during the installation of system 10, it is configured to take on the attitude of a master device 12.

[0014] With reference, in particular, to figure 3, each one of slave devices 14 and, if necessary, also master device 12 can be installed in a respective region or partition of the area to be monitored and comprises:

- a signalling apparatus, which is indicated as a whole with number 16, to be activated and to provide at least one alarm indication, detectable by the people present in said area, and
- a control organ 18 to be manually activated by an operator, for example when a danger situation occurs in said area.

[0015] Each one of slave devices 14 is configured to activate its own signalling apparatus 16 and to transmit an emergency signal to master device 12 when its own control organ 18 is activated.

[0016] Furthermore, master device 12 is configured to transmit an activation signal to a series of said slave devices 14 when it receives the emergency signal. In the embodiment shown, master device 12 is programmed to transmit the activation signal to all slave devices 14 when it receives the emergency signal from one of the slave devices in which control organ 18 has been activated. Alternatively, master device 12 can be configured to selectively transmit the activation signal to a series of slave

devices 14 that can be determined as a function of slave device 14 that has transmitted the emergency signal according to predetermined criteria. For example, the activation signal can be transmitted to those slave devices 14 that are installed in regions that are adjacent to slave device 14 that transmitted the emergency signal to master device 12. In this way, the signal generated by one of slave devices 14 can be shared and used to automatically activate one or more signalling apparatuses 16, thus enabling the warning and the evacuation of the people standing in the regions affected by the alarm indications emitted by means of system 10.

[0017] Each one of slave devices 14 is configured to activate its own signalling apparatus 16 when it receives the activation signal transmitted by master device 12.

[0018] Master device 12 and slave devices 14 are configured to transmit and receive said emergency signal and said activation signal through a wireless telecommunication network, for example a WLAN local network. In this way, there is no need to wire one or more data transmission lines that would allow a wire communication between master device 12 and slave devices 14.

[0019] With reference to the embodiments shown in figures 1 and 2, devices 12, 14 are connected to one another, by way of example, through a telecommunication network of the mesh type and of the linear type respectively.

[0020] Preferably, the telecommunication network uses a radio wave communication channel.

[0021] More preferably, the above-mentioned communication network uses a series of standard communication protocols of the ZigBee type, namely based on the IEEE 802.15.4 technological standard. In this way, one can obtain different advantages, among which:

- an encryption of the data transmitted between devices 12, 14, for example according to an AES mode at 128bit,
- an intrinsic safety in the communication protocols in the data transmission and reception, and
- an operating mode of the mesh type, in which every slave device 14 can act as a repeater or router for the activation signal transmitted by master device 12 through the telecommunication network, when a control organ 16 of a slave device 14 is activated by a person to signal a danger or emergency situation.

[0022] Preferably, system 10 comprises, furthermore, a warning device, which is controlled by master device 12 and is configured to transmit an aid signal, for example through an external telecommunication network, when said master device 12 transmits the activation signal. In this way, the emergency occurring in the monitored region in which signalling apparatus 18 has been activated can be promptly communicated, which makes it easier for the operators to prepare the intervention means that are necessary to deal with the danger that has been signalled.

[0023] More preferably the above-mentioned warning device is a phone dialer, which is configured to transmit the aid signal through an external telephone network, for example a mobile phone network, such as the GSM network. In this way operators can promptly warn one or more authorities in charge of the rescuing activities, such as the fire department, the first aid department, the police forces, etc..

[0024] In the embodiment shown, the warning device is manufactured as a module that is built-in in master device 12.

[0025] Optionally, at least one of slave devices 14 comprises a sensor apparatus, for example a smoke or gas detector, which is configured to detect emergency conditions representing a danger occurring in said region in which said slave device 14 is installed. Slave device 14 is configured to activate its own signalling apparatus 16 and to transmit, through the wireless telecommunication network, an emergency signal to master device 12, when its own sensor apparatus detects the above-mentioned emergency conditions (for example, the break out of a fire or a gas leak). In this case, master device 12 substantially acts as if the emergency signal were transmitted by slave device 14 after the activation of control organ 18; in other words, master device 12 transmits the activation signal to a series of slave devices 14.

[0026] Preferably, master device 12 is configured to transmit, through the wireless telecommunication network, a deactivation signal to said slave devices 14, when master device 12 is manually switched by an operator, who, by way of example, acts on a pressure-operated push-button for an extended amount of time (for example pushing it for an amount of time ranging from 30 to 40 s) or activates a key switch. Each one of slave devices 14 is configured to deactivate its own signalling apparatus 16 when it receives the deactivation signal. In this way, system 10 can be quickly restored in order to go back to the normal operating mode after the cause of the danger has been properly removed.

[0027] Preferably, at least one device of the assembly made up of slave devices 14 and of master device 12 is configured to be supplied with power by an external power supply network and comprises a power supply indicator 20, adapted to provide a detectable warning concerning the connection of respective device 12, 14 to the power supply network. More preferably, power supply indicator 20 is an optical signaller, such as a warning light.

[0028] In the embodiment shown, slave devices 14 and master device 12 are configured to be supplied with power by an external power supply network and are provided with respective power supply indicators 20.

[0029] Preferably, at least one device of the assembly made up of slave devices 14 and of master device 12 comprises a battery, which is able to supply power to device 12, 14 when it is not connected to the external power supply network.

[0030] In the embodiment shown, slave devices 14 and master device 12 are provided with respective batteries.

[0031] Preferably, at least one of slave devices 14 is adapted to detect at least one among the following fault conditions:

- a disconnection of slave device 14 from an external power supply network;
- a transmission of said emergency signal from slave device 14 to master device 12; and
- an irregularity in the operation of said slave device 14.

[0032] Preferably, said at least one slave device 14 comprises at least one fault indicator 20, 22, adapted to provide a detectable warning, which is relative to the occurrence of at least one of the above-mentioned fault conditions. In the embodiment shown, the slave device comprises a power supply indicator 20, which is adapted to signal the absence of an external power supply, and an emergency/irregularity indicator 20, which is adapted to signal the occurrence of an emergency/irregularity.

[0033] Preferably, said at least one fault indicator 20 is an optical signaller, such as a warning light.

[0034] Preferably, said at least one slave device 14 is adapted to transmit to master device 12, through the wireless telecommunication network, a control signal indicating the occurrence of at least one of the fault conditions and representing the identity of transmitting slave device 14.

[0035] Preferably, master device 12 comprises detecting means 24, which are adapted to provide a detectable warning concerning the reception of said control signal by master device 12 or the disconnection of at least one slave device 14 from wireless telecommunication network 14. More preferably, said detectable warning is of the visual type.

[0036] By way of example, the detecting means comprise a screen, which is configured to provide a visible representation of at least one of the following items of information carried by said control signal:

- the identity of slave device 14 that transmitted the control signal; and
- the fault condition that triggered the transmission of the control signal.

[0037] In the embodiment shown, the displaying means comprise a plurality of control indicators 24, in which each one of them is associated with a slave device 14 and is adapted to provide a visible warning concerning the fact that slave device 14 associated therewith transmitted the control signal. For example, each one of control indicators 24 is an optical signaller, such as a warning light.

[0038] Preferably, the master device is configured to transmit to a remote unit a diagnostic signal representing at least one of the following conditions:

- the reception of the control signal received by at least

one of slave devices 14; and

- the detection of a disconnection of at least one of slave devices 14 from said wireless telecommunication network.

[0039] For example, master device 12 comprises a transmitter module, which is able to transmit the diagnostic signal comprising a text message of the SMS type through a phone telecommunication network, preferably a mobile phone telecommunication network. Advantageously, the transmitter module can be a module of the GPRS type.

[0040] The detection of the disconnection of computers 14 from the wireless telecommunication network can occur, for example, by means of the transmission, through the wireless telecommunication network, of a connection signal to the master device by the slave devices at predetermined time intervals, for example in a periodic manner. Master device 12 is configured to receive the connection signal transmitted by at least one of slave devices 14. If master device 12 does not receive said connection signal transmitted by at least one of slave devices 14 through the network within a predetermined time interval, it transmits the diagnostic signal to the remote unit. In the embodiment shown, signalling apparatus 16 comprises an acoustic signaller 26, such as a siren (for example operating at 116 dB/m), and a light signaller 28, for example a flashlight or a rotating beacon (for example operating with a red/orange light emission).

[0041] In the embodiment shown, control organ 18 comprises a pressure-operated push-button, for example a mushroom push-button.

[0042] In the embodiment shown, at least one device of the assembly made up of slave devices 14 and of master device 12 comprises a casing 30, preferably a box-shaped casing (for example having the dimensions 30 cm X 30 cm X 20 cm), which protects the inner components of device 12, 14 in a fluid-tight manner. Casing 30 preferably supports signalling apparatus 16 and control organ 18 and, if necessary, at least one of indicators 20, 22 and 24.

[0043] In the embodiment shown, slave devices 14 and master device 12 are provided with respective casings 30.

Claims

1. An alarm system (10) for an area to be monitored, in particular a commercial or industrial area, such as a construction site; said system (10) comprising a master device (12) and a plurality of slave devices (14), which are controlled by said master device (12); each one of said slave devices (14) being adapted to be installed in a region or partition of said area to be monitored and comprising:

- a signalling apparatus (16), to be activated and

provide at least one alarm indication, detectable by the people present in said area, and
- a control organ (18), to be manually activated by an operator, when a dangerous situation occurs in said area;

each one of said slave devices (14) being configured to activate its own signalling apparatus (16) and transmit an emergency signal to said master device (12), when its own control organ is activated (18); said master device (12) being configured to transmit an activation signal to a series of said slave devices (14) as a function of said emergency signal received; each one of said slave devices (14) being configured, furthermore, to activate its own signalling device (16), when it receives said activation signal; said devices (12, 14) being configured to transmit and receive said emergency signal and said activation signal through a wireless telecommunication network.

2. System according to claim 1, wherein said telecommunication network presents a mesh topology or a line topology.
3. System according to any of the previous claims, wherein said communication network uses a radio-wave communication channel.
4. System according to claim 3, wherein the telecommunication network uses a series of standard communication protocols of the ZigBee type.
5. System according to any of the previous claims, comprising, furthermore, a warning device, which is controlled by said master device (12) and is configured to transmit an aid signal, when said master device (12) transmits said activation signal.
6. System according to claim 5, wherein said warning device is a phone dialer, which is configured to transmit said aid signal through an external telephone network.
7. System according to any of the previous claims, wherein at least one of said slave devices (14) comprises a sensor apparatus, which is configured to detect emergency conditions representing a danger occurring in said area in which said slave device (14) is installed;
said at least one of said slave devices (14) being configured to activate its own signalling apparatus (16) and transmit, through said wireless telecommunication network, an emergency signal to said master device (12), when its own sensor apparatus detects said emergency conditions.
8. System according to any of the previous claims,

wherein the master device (12) is configured to transmit, through said wireless telecommunication network, a deactivation signal to said slave devices (14), when it is manually switched by an operator; each one of said slave devices (14) being configured to deactivate its own signalling device (16), when it receives said deactivation signal.

9. System according to any of the previous claims, wherein at least one device of the assembly made up of said slave devices (14) and of said master device (12) is configured to be supplied with power by an external power supply network.
10. System according to claim 9, wherein at least one device of the assembly made up of said slave devices (14) and of said master device (12) comprises a battery, to allow said at least one device (12, 14) to be supplied with power, when it is not connected to the external power supply network.
11. System according to any of the previous claims, wherein at least one of said slave devices (14) is adapted to detect at least one among the following fault conditions:
 - a disconnection of said slave device (14) from an external power supply network;
 - a transmission of said emergency signal from said slave device (14) to said master device (12); and
 - an irregularity in the operation of said slave device (14).
12. System according to claim 11, wherein said slave device (14) comprises at least one fault indicator (20, 22), for providing a detectable signalling, which is relative to the occurrence of at least one of said fault conditions.
13. System according to claim 11 or 12, wherein said slave device (14) is adapted to transmit to said master device (12), through said wireless telecommunication network, a control signal indicating the occurrence of said at least one fault conditions and representing the transmitting slave device (14).
14. System according to claim 13, wherein said master device (12) comprises detecting means (24), for providing a detectable signalling representing said control signal received by said slave device (14).
15. System according to claim 13 or 14, wherein said master device (12) is configured to transmit to a remote unit a diagnostic signal representing at least one of the following conditions:
 - the receipt of said control signal received by at

least one of said slave devices (14); and
- the detection of a disconnection of at least one
of the slave devices (14) from said wireless tel-
ecommunication network.

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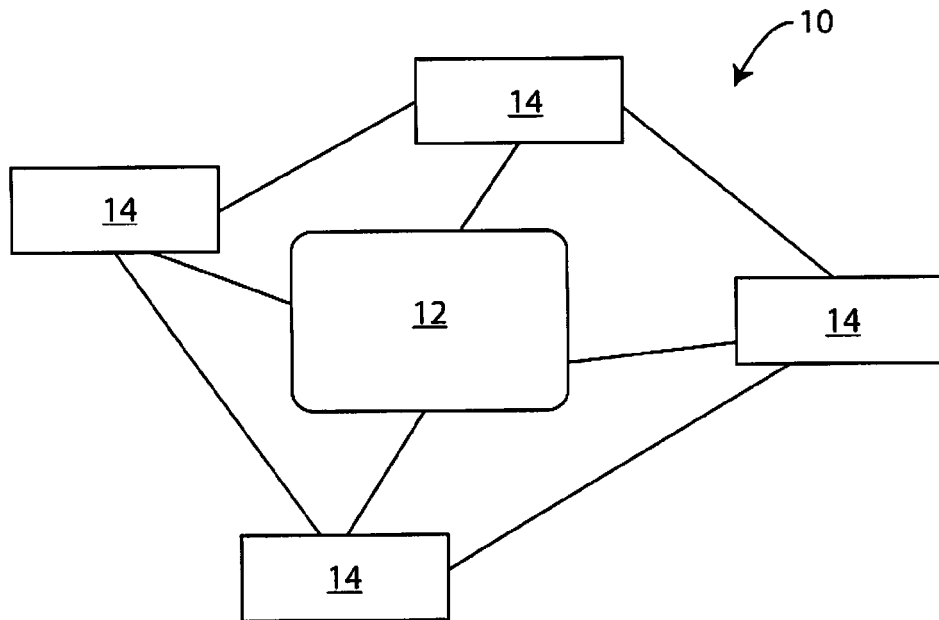


Fig. 1

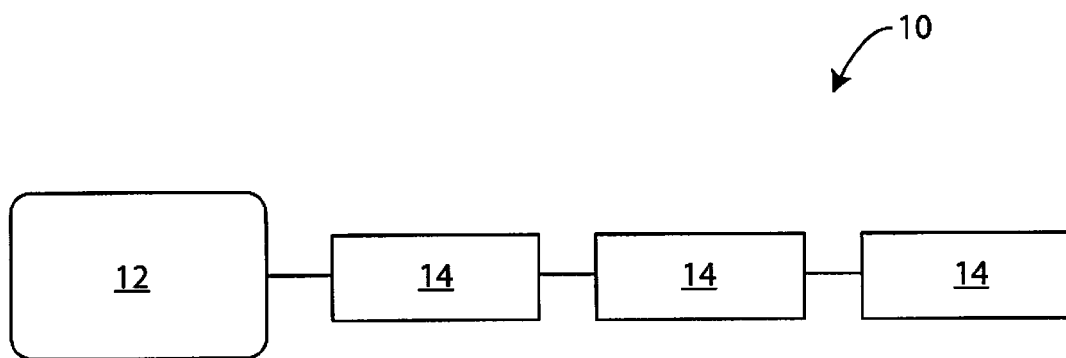


Fig. 2

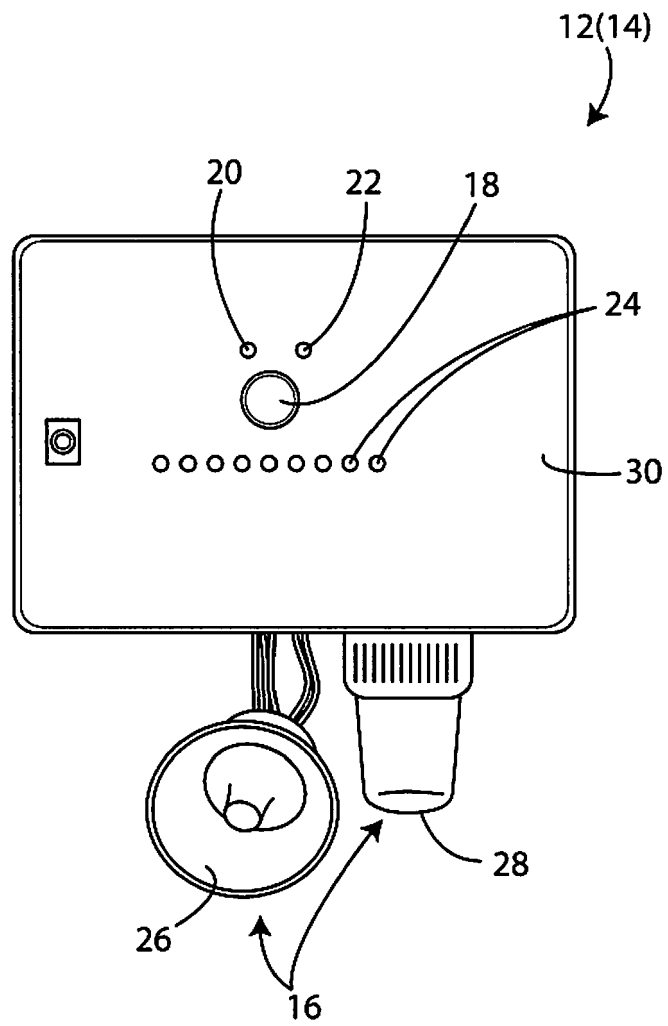


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 13 17 0362

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2006/085781 A1 (EVACUATION ALARMS & SYSTEMS NZ [NZ]; MITSCHAK ROBERT JAMES [NZ]) 17 August 2006 (2006-08-17) * paragraph [0080] - paragraph [0081] * * paragraph [0079] * * paragraph [0092] - paragraph [0097] * * paragraph [0153] * * paragraph [0068] * * paragraph [0155] *	1-15	INV. G08B7/06 G08B25/12 G08B27/00
X	WO 2008/105578 A1 (ULSAN METROPOLITAN CITY [KR]; HYUN DAI HEAVY IND CO LTD [KR]; LEE KI W) 4 September 2008 (2008-09-04) * paragraph [0022] * * paragraph [0032] * * paragraphs [0034] - [0036] * * paragraph [0045] * * paragraphs [0054] - [0055] * * paragraph [0070] * * paragraphs [0072] - [0073] * * paragraphs [0076] - [0077] *	1-15	
X	EP 2 199 997 A2 (NOHMI BOSAI LTD [JP]) 23 June 2010 (2010-06-23) * paragraphs [0021] - [0046]; figures 1,2 *	1-15	
X	US 2010/079278 A1 (SUZUKI JUNICHI [JP] ET AL) 1 April 2010 (2010-04-01) * paragraphs [0025] - [0028]; figures 1-3 *	1-15	
A	FR 2 966 961 A1 (COOPER TECHNOLOGIES CO [US]) 4 May 2012 (2012-05-04) * page 5, line 3 - page 7, line 12; figures 1,2 *	1-15	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 1 October 2013	Examiner de la Cruz Valera, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 13 17 0362

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 019 805 A (CURL RICKY L [US] ET AL) 28 May 1991 (1991-05-28) * column 2, lines 22-43 * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 1 October 2013	Examiner de la Cruz Valera, D
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 17 0362

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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01-10-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006085781 A1	17-08-2006	AU 2006200598 A1	31-08-2006
		NZ 538232 A	26-05-2006
		WO 2006085781 A1	17-08-2006
WO 2008105578 A1	04-09-2008	EP 2115645 A1	11-11-2009
		KR 100846829 B1	16-07-2008
		WO 2008105578 A1	04-09-2008
EP 2199997 A2	23-06-2010	CN 101819709 A	01-09-2010
		EP 2199997 A2	23-06-2010
		JP 5213672 B2	19-06-2013
		JP 2010134737 A	17-06-2010
		KR 20100065090 A	15-06-2010
		TW 201032185 A	01-09-2010
		US 2010141461 A1	10-06-2010
US 2010079278 A1	01-04-2010	EP 2100279 A1	16-09-2009
		JP 4655165 B2	23-03-2011
		JP 4881438 B2	22-02-2012
		JP 4883195 B2	22-02-2012
		JP 2010170557 A	05-08-2010
		JP 2010218587 A	30-09-2010
		JP 2010515110 A	06-05-2010
		US 2010079278 A1	01-04-2010
		WO 2008088079 A1	24-07-2008
FR 2966961 A1	04-05-2012	NONE	
US 5019805 A	28-05-1991	NONE	